Grade 9 Biology - Marking Period 4

Living Environment

STANDARD	PERFORMANCE INDICATORS	PACING DAYS	RESOURCES (Print, Visual, Technology, Manipulatives)	ASSESSMENT (Evidence & Scoring Guides)
L.E. 4.2	• Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.			
L.E. 4.2A	• Students explain how the structure and replication of genetic material result in offspring that resemble their parents.			
L.E. 4.2A1	• Genes are inherited, but their expression can be modified by interactions with the environment.			
L.E. 4.2A2	• Every organism requires a set of coded instructions for specifying its traits. For offspring to resemble their parents, there must be a reliable way to transfer information from one generation to the next. Heredity is the passage of these instructions from one generation to another.			
L.E. 4.2A3	• Hereditary information is contained in genes, located in the chromosomes of each cell. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes in its nucleus.			
L.E. 4.2A4	• In asexually reproducing organisms, all the genes			

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	come from a single parent. Asexually produced offspring are normally genetically identical to the parent.			
L.E. 4.2A5	• In sexually reproducing organisms, the new individual receives half of the genetic information from its mother (via the egg) and half from its father (via the sperm). Sexually produced offspring often resemble, but are not identical to, either of their parents.			
L.E. 4.2A6	• In all organisms, the coded instructions for specifying the characteristics of the organism are carried in DNA, a large molecule formed from subunits arranged in a sequence with bases of four kinds (represented by A, G, C, and T). The chemical and structural properties of DNA are the basis for how the genetic information that under-lies heredity is both encoded in genes (as a string of molecular “bases”) and replicated by means of a template.			
L.E. 4.2A7	• Cells store and use coded information. The genetic information stored in DNA is used to direct the synthesis of the thousands of proteins that each cell requires.			
L.E. 4.2A8	• Genes are segments of DNA molecules. Any alteration of the DNA sequence is a mutation. Usually, an altered gene will be passed on to every cell that develops from it.			

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L.E. 4.2A9	• The work of the cell is carried out by the many different types of molecules it assembles, mostly proteins. Protein molecules are long, usually folded chains made from 20 different kinds of amino acids in a specific sequence. This sequence influences the shape of the protein. The shape of the protein, in turn, determines its function.			
L.E. 4.2A10	• Offspring resemble their parents because they inherit similar genes that code for the production of proteins that form similar structures and perform similar functions.			
L.E. 4.2A11	• The many body cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic instructions. This is because different parts of these instructions are used in different types of cells, and are influenced by the cell's environment and past history.			
L.E. 4.2B	• Students explain how the technology of genetic engineering allows humans to alter the genetic makeup of organisms.			
L.E. 4.2B1	• For thousands of years, new varieties of cultivated plants and domestic animals have resulted from selective breeding for particular traits.			

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L.E. 4.2B2	• In recent years, new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to produce new characteristics.			
L.E. 4.2B3	• Different enzymes can be used to cut, copy, and move segments of DNA. Characteristics produced by the segments of DNA may be expressed when these segments are inserted into new organisms, such as bacteria.			
L.E. 4.2B4	• Inserting, deleting, or substituting DNA segments can alter genes. An altered gene may be passed on to every cell that develops from it.			
L.E. 4.2B5	• Knowledge of genetics is making possible new fields of health care; for example, finding genes which may have mutations that can cause disease will aid in the development of preventive measures to fight disease. Substances, such as hormones and enzymes, from genetically engineered organisms may reduce the cost and side effects of replacing missing body chemicals.			
L.E. 4.3	• Individual organisms and species change over time.			
L.E. 4.3A	• Students explain the mechanisms and patterns of evolution.			
L.E. 4.3A2	• New inheritable characteristics can result from new combinations of existing genes or from mutations of genes in reproductive cells.			

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L.E. 4.3A3	• Mutation and the sorting and recombining of genes during meiosis and fertilization result in a great variety of possible gene combinations.			
L.E. 4.3A4	• Mutations occur as random chance events. Gene mutations can also be caused by such agents as radiation and chemicals. When they occur in sex cells, the mutations can be passed on to offspring; if they occur in other cells, they can be passed on to other body cells only.			
L.E. 4.3A5	• Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life-forms, as well as for the molecular and structural similarities observed among the diverse species of living organisms.			
L.E. 4.3A6	• Species evolve over time. Evolution is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring.			
L.E. 4.3A7	• Some characteristics give individuals an advantage over others in surviving and reproducing, and the advantaged offspring, in turn, are more likely than			

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	others to survive and reproduce. The proportion of individuals that have advantageous characteristics will increase.			
L.E. 4.3A8	• The variation of organisms within a species increases the likelihood of at least some members of the species will survive under changed environmental conditions.			
L.E. 4.3A9	• Behaviors have evolved through natural selection. The broad patterns of behavior exhibited by organisms are those that have resulted in greater reproductive successes.			
L.E. 4.3A10	• Billions of years ago, life on Earth is thought by many scientists to have begun as simple, single-celled organisms. About a billion years ago, increasingly complex multi-cellular organisms began to evolve.			
L.E. 4.3A11	• Evolution does not necessitate long-term progress in some set direction. Evolutionary changes appear to be like the growth of a bush. Some branches survive from the beginning with little or no change, many die out altogether, and others branch repeatedly, sometimes giving rise to more complex organisms.			
L.E. 4.3A12	• Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species			

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	that have lived on Earth no longer exist.			
L.E. 4.1	• Living things are both similar to and different from each other and from nonliving things.			
L.E. 4.1A	• Students explain how diversity of populations within ecosystems relates to the stability of ecosystems.			
L.E. 4.1A1	• Populations can be categorized by the function they serve. Food webs identify the relationships among producers, consumers, and decomposers carrying out either autotrophic or heterotrophic nutrition.			
L.E. 4.1A2	• An ecosystem is shaped by the nonliving environment as well as its interacting species. The world contains a wide diversity of physical conditions, which creates a variety of environments.			
L.E. 4.1A3	• In all environments, organisms compete for vital resources. The linked and changing interactions of populations and the environment compose the total ecosystem.			
L.E. 4.1A4	• The interdependence of organisms in an established ecosystem often results in approximate stability over hundreds and thousands of years. For example, as one population increases, it is held in check by one or more environmental factors or another species.			
L.E. 4.1A5	• Ecosystems, like many other complex systems, tend to show cyclic changes around a state of approximate			

	equilibrium.			
L.E. 4.1A6	• Every population is linked, directly, or indirectly, with many others in an ecosystem. Disruptions in the numbers and types of species and environmental changes can upset ecosystem stability.			
L.E. 4.6	• Plants and animals depend on each other and their physical environment.			
L.E. 4.6A	• Students explain factors that limit growth of individuals and populations.			
L.E. 4.6A1	• Energy flows through ecosystems in one direction, typically from the Sun, through photosynthetic organisms including green plants and algae, to herbivores to carnivores and decomposers.			
L.E. 4.6A2	• The atoms and molecules on the Earth cycle among the living and nonliving components of the biosphere. For example, carbon dioxide and water molecules used in photosynthesis to form energy-rich organic compounds are returned to the environment when the energy in these compounds is eventually released by cells. Continual input of energy from sunlight keeps the process going. This concept may be illustrated with an energy pyramid.			
L.E. 4.6A3	• The chemical elements, such as carbon, hydrogen, nitrogen, and oxygen, that make up the molecules of			

	living things pass through food webs and are combined and recombined in different ways. At each link in a food web, some energy is stored in newly made structures but much is dissipated into the environment as heat.			
L.E. 4.6A4	• The number of organisms any habitat can support (carrying capacity) is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organisms through the activities of bacteria and fungi.			
L.E. 4.6A5	• In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH).			
L.E. 4.6A6	• Living organisms have the capacity to produce populations of unlimited size, but environments and resources are finite. This has profound effects on the interactions among organisms.			
L.E. 4.6A7	• Relationships between organisms may be negative, neutral, or positive. Some organisms may interact with one another in several ways. They may be in a producer/consumer, predator/prey, or parasite/host relationship; or one organism may cause disease in, scavenge, or decompose another.			

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L.E. 4.6B	• Students explain the importance of preserving diversity of species and habitats.			
L.E. 4.6B1	• As a result of evolutionary processes, there is a diversity of organisms and roles in ecosystems. This diversity of species increases the chance that at least some will survive in the face of large environmental changes. Biodiversity increases the stability of the ecosystem.			
L.E. 4.6B2	• Biodiversity also ensures the availability of a rich variety of genetic material that may lead to future agricultural or medical discoveries with significant value to humankind. As diversity is lost, potential sources of these materials may be lost with it.			
L.E. 4.6BC	• Students explain how the living and nonliving environments change over time and respond to disturbances.			
L.E. 4.6C1	• The interrelationships and interdependencies of organisms affect the development of stable ecosystems.			
L.E. 4.6C2	• Through ecological succession, all ecosystems progress through a sequence of changes during which one ecological community modifies the environment, making it more suitable for another community. These long-term gradual changes result in the community reaching a point of stability that can last for hundreds			

	or thousands of years.			
L.E. 4.6C3	• A stable ecosystem can be altered, either rapidly or slowly, through the activities of organisms (including humans), or through climatic changes or natural disasters. The altered ecosystem can usually recover through gradual changes back to a point of long-term stability.			
L.E. 4.7	• Human decisions and activities have had a profound impact on the physical and living environment.			
L.E. 4.7A	• Human decisions and activities have had a profound impact on the physical and living environment.			
L.E. 4.7A1	• The Earth has finite resources; increasing human consumption of resources places stress on the natural processes that renew some resources and deplete those resources that cannot be renewed.			
L.E. 4.7A2	• Natural ecosystems provide an array of basic processes that affect humans. Those processes include but are not limited to: maintenance of the quality of the atmosphere, generation of soils, control of the water cycle, removal of wastes, energy flow, and recycling of nutrients. Humans are changing many of these basic processes and the changes may be detrimental.			
L.E. 4.7A3	• Human beings are part of the Earth's ecosystems.			

	Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems. Humans modify ecosystems as a result of population growth, consumption, and technology. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems may be irreversibly affected.			
L.E. 4.7B	• Students explain the impact of technological development and growth in the human population on the living and nonliving environment.			
L.E. 4.7B1	• Human activities that degrade ecosystems result in a loss of diversity of the living and nonliving environment. For example, the influence of humans on other organisms occurs through land use and pollution. Land use decreases the space and resources available to other species, and pollution changes the chemical composition of air, soil, and water.			
L.E. 4.7B2	• When humans alter ecosystems either by adding or removing specific organisms, serious consequences may result, For example, planting large expanses of one crop reduces the biodiversity of the area.			
L.E. 4.7B3	• Industrialization brings an increased demand for and use of energy and other resources including fossil and nuclear fuels. This usage can have positive and			

	negative effects on humans and ecosystems.			
L.E. 4.7C	• Students explain the impact of technological development and growth in the human population on the living and nonliving environment.			
L.E. 4.7C1	• Societies must decide on proposals which involve the introduction of new technologies. Individuals need to make decisions which will assess risks, costs, benefits, and trade-offs.			
L.E. 4.7C2	• The decisions of one generation both provide and limit the range of possibilities open to the next generation.			